Tax Avoidance, Redistribution and Voting

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Abstract

The main question addressed in this paper is how the possibility of investing in tax avoidance affects voting and redistributive outcomes in an economy where the tax rate is determined by a majority vote and taxes go to lump-sum redistribution. The outcome depends on the timing and efficiency of tax avoidance. It is shown that in all cases those who invest in tax avoidance pay proportionally less in taxes than others. Politically two cases can be distinguished. One where the population is divided according to income and the median income earner is decisive, and one where the most affluent form a coalition with those with low income and the decisive voter has lower than median income.

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"A democratic government is the only one in which those who vote for a tax can escape the obligation to pay it."

Alexis de Tocqueville in "Democracy in America"

1 Introduction

Many of the early writers concerned with the redistributive aspects of government activity thought that universal suffrage would lead to the poorer half of the population expropriating the richer through the tax system. In Alexis de Toqueville's words: "*As most of the voters have no taxable property, apparently all money spent in the interest of society can only profit and never harm them [...] Universal suffrage really does hand the government of society over to the poor.*"[1]

Universal suffrage has not, however, lead to the expropriation of the rich through the tax system. Even though redistribution has increased over time, as the franchise has been extended to those with lower incomes, it has not done so without limit. A number of different explanations have been suggested, but it is fair to say that the dominant one has been that high taxes have negative effects on the labor supply.[2] This idea, that the main feasible response to tax changes lies in a change of work hours, has dominated both the econometric analysis of taxation, as well as the normative work following Mirrlees (1971).[3] The same can be said for the economic literature concerned with the politics of redistribution and voting. In a number of articles it has been shown that if individuals take work disincentive effects into account when voting over the tax

[1] Toqueville (1969/1848), p. 209. The idea of government by majority rule leading to expropriation dates back to Aristotle. It was later raised by, for example, the writers of the US constitution, (to quote John Adams "...it is self-evident that the few are at the mercy of the many"), and by David Ricardo who thought that voting rights can only be given to those who "cannot be supposed to have any interest in overturning the rights of property" (Ricardo (1818/1952), Vol. VII, p.370). It should, however, be emphasized that this view made him far more liberal than many of his contemporaries, (see ibid. Vol. V, pp. 490-493). The problem was introduced into the study of modern public finance by Tullock (1959).

[2] The idea of negative effects on labor supply can be traced back to Adam Smith (see for example Smith (1776/1976) p. 91) and was later pointed out by e.g. Joseph Schumpeter who in his "The Crises of the Tax State" writes that "additional taxation of higher labor incomes discourages all above-average effort wherever the effort is not its own end" (Schumpeter 1918/1991). See e.g. Roemer (1999) p. 400 for other explanations.

[3] See e.g. Hausman (1981), Blomquist and Hansson-Brusewitz (1990), MaCurdy, Green and Paarsch (1990) and Blomquist (1996).

rate, it is no longer optimal for a poorer majority to try to completely equalize after-tax income.[4]

This view has a number of problems though. Many of the econometric studies, trying to measure the responsiveness of labor supply to taxes, seem to suggest that the response is quite modest.[5] A number of studies that have tried to rank different behavioral responses to tax changes find that such real responses are, in fact, the *least* significant in a hierarchy of actions taken. More important are a variety of financial and accounting responses taken to avoid tax without altering the real choice variables.[6] For many such responses both the possibilities and the incentives to avoid tax increase with income. One reason for this could be that high income earners can choose tax favored forms of income and saving to a larger extent than others. Another would be that hiring tax consultants, or making other investments in tax avoidance, only becomes profitable if one has a sufficiently high income.[7] If such tax avoidance activities are important - which the studies mentioned above seem to suggest - this will also have effects on the redistributive outcome. As was noted by Gunnar Myrdal (1978), high taxes can give incentives for high income earners to exploit a variety of tax avoidance schemes so as to give a system that no longer redistributes income. Consequently a number of authors have stressed the importance of incorporating tax avoidance into the theory of taxation.[8]

For the same reasons it also seems to be important to take these insights one step further, and introduce tax avoidance into theories dealing with the political side of determining the tax rate and the consequent size of redistribution. This paper is an attempt at doing so. The main question addressed in this paper is how the possibility of investing in tax avoidance affects voting and redistributive outcomes in an economy where the tax rate is determined by a majority vote and taxes go to lump-sum redistribution.

The model developed here focuses on the effect from tax avoidance, and it is therefore assumed that wages are exogenously fixed and given.[9] This assumption enables an analysis of the tax avoidance effect in isolation from labor supply decisions. Individuals, who all differ in initial income, are given the possibility to

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[4] E.g. Romer (1975), Roberts (1977), Auman and Kurz (1977), Meltzer and Richard (1981) and Cukierman and Meltzer (1991).

[5] See e.g. Blomquist and Hansson-Brusewitz (1990), Aronsson and Palme (1995) and Agell, Englund and Södersten (1996).

[6] Slemrod (1992), Feldstein (1995) and Auerbach and Slemrod (1997).

[7] Agell and Edin (1990), Alm and Wallace (1997), Auerbach, Burman and Siegel (1997), Goolsbee (1997), Samwick (1997), Agell and Persson (1998) and Slemrod (1998a).

[8] For example Agell and Persson (1998) and Slemrod (1998b).

[9] "Tax avoidance" here means any costly measure taken to avoid tax and hence can be said to include what in some cases would be labeled "tax evasion". In terms of how it is modeled it is, however, not "tax evasion" in the tradition following Allingham and Sandmo (1972) but rather "tax avoidance" in the sense of Slemrod (1998b), that is a known cost for a certain tax reduction with no uncertainty about the outcome. For a discussion on the terminology see Cowell (1990) pp. 9-14. It is also implicitly assumed that avoidance possibilities always exists. They can be of varying cost but are an inherent part of any tax system, something which is argued in Shackelford (1997).

avoid a share of their tax payment through investing a fixed and known amount in tax avoidance. Such an avoidance technology has the virtue of being simple at the same time as it captures the most relevant feature of tax avoidance discussed in the empirical literature, namely that both incentives and possibilities to invest in avoidance increase with income. The basic problem for each individual then consists of two decisions; the choice of whether or not to invest in tax avoidance and how to vote.[10] Depending on the timing of these decisions, as well as on the efficiency of the tax avoidance technology, different equilibria emerge.

First, if avoidance decisions have to be made before the election, a situation similar to the so called 'capital levy problem' emerges.[11] In this situation the tax base is perfectly inelastic at the time of the vote, and under the assumption that the decisive voter gains from redistribution, the equilibrium will be a tax rate of unity. Anticipating this everyone, who at that tax rate gains from investing in tax avoidance, would choose to do so. This leads to a complete equalization of disposable income for the share of the population that does not invest in tax avoidance, while those who do are left with more.

If, however, the avoidance decision also can be taken after the election, each tax rate leads to a certain amount of tax avoidance that has to be taken into account at the time of voting. Now the outcome depends on the efficiency of the avoidance technology. In situations where the tax reduction is small, tax avoiders are still opposed to high taxes and the standard median voter theorem holds.[12] If the tax reduction is sufficiently large though, tax avoiders no longer necessarily oppose higher taxes. In such a situation the standard median voter theorem does not apply and an equilibrium need no longer exist. It is shown, however, that if there is an equilibrium, a coalition of the highest and lowest income earners prefer increased taxes and redistribution, while the middle income group would prefer a decrease. It is also shown that the decisive voter in this situation is one with a lower income than the median voter.[13] In terms of disposable income the tax avoiders are again left with proportionally more than those who pay full taxes.

The paper is organized as follows: In section 2 the model is presented in detail. First the conditions for optimal tax avoidance and its impact on the government budget are described, followed by the individual optimization problem. Section 3 deals with the different political equilibria and in section 4 a numerical example is used to illustrate the possible outcomes. Section 5 concludes.

[10]Technically this type of binary choice paired with the choice of how to vote is similar to that in Lindbeck, Nyberg and Weibull (1999).

[11]See Persson and Tabellini (1990), ch. 6 and Persson and Tabellini (1994) for a discussion on the capital levy problem.

[12]The political equilibrium concept used here uses the median voter theorem developed in Gans and Smart (1996) following Roberts (1977) and Rothstein (1991).

[13]These results are similar to the "ends against the middle" results in Epple and Romano (1996a) and (1996b). The possibility of political coalitions between the rich and the poor, with a decisive voter with lower income than the median, have been noted by many authors dealing with public goods provision with private alternatives starting with Barzel (1973).

2 The Model

The economy considered here is populated by a continuum of individuals who all are assumed to have the same increasing and concave utility function over consumption, $u(c)$. Formally $u(c)$ is twice continuously differentiable with $u'(c) > 0$ and $u''(c) < 0$. Everyone has an exogenously given pre-tax wage w^i. Wages are distributed according to a continuously differentiable cumulative probability distribution function, Φ, which is taken to be fixed and given. The population is normalized to one and thus and $\Phi(\infty) = 1$. For each positive wage level, w, there is a positive density, $\varphi(w) = \Phi'(w)$, and no individual has a negative wage and hence $\Phi(0) = 0$. Furthermore Φ is assumed to have a finite mean and a median income denoted w^m.

A proportional income tax, $t \in [0, 1]$, is used to finance a lump-sum transfer of r units of consumption which is received by everyone. Individuals can, however, avoid paying a share $(1-\delta)$, $\delta \in [0, 1]$, of the tax through investing a lump-sum $A \in (0, +\infty)$ in tax avoidance. In the case that $\delta = 0$ avoidance is complete and the tax avoider only pays the avoidance cost. This way of modeling tax avoidance gives a simple form that approximates some of the empirically most relevant features of tax avoidance.[14] A and δ are parameters in the model that can be changed to approximate different avoidance situations.

2.1 Optimal Tax Avoidance

An individual i chooses to invest in tax avoidance if that choice results in higher utility than paying full taxes, that is if

$$u(w^i - A - \delta t w^i + r) > u(w^i - t w^i + r). \tag{1}$$

Equation (1) states that if the utility from investing A, and then paying a lower tax $\delta t w_i$, is higher than the utility from paying the full tax $t w_i$ then the individual will invest in tax avoidance.

Since the tax avoidance efficiency δ and the avoidance cost A are taken to be exogenous parameters while the tax rate t is endogenous there exists a unique critical wage, $w^*(t; \delta, A)$, for every t such that all individuals with a lower wage than w^* choose to pay taxes while those with a higher wage choose to avoid tax. We can identify the critical wage, w^*, as the unique solution to the equation

$$w^* - A - \delta t w^* + r = w^* - t w^* + r$$

which gives that if $\delta < 1$ and $t > 0$ then

[14] Most importantly it captures the empirical fact that the most affluent individuals are the ones who both have the option to invest in tax avoidance- you need at least A to be able to invest - and who gain the most from doing so - the same investment, A, gives everyone the same proportional reduction. It can also be argued that many actual avoidance activities, such as seeking legal advice or moving assets abroad, have this kind of sunk-cost property.

$$w^*(t;\delta,A) = \frac{A}{(1-\delta)t}. \tag{2}$$

>From (2) we see that w^* is increasing in A and in δ while it is decreasing in t. This means that the more expensive it is to avoid tax and the less the investment reduces taxes, the higher must the individuals wage be for this to be profitable. Similarly, the higher the tax rate the smaller is the critical wage for choosing tax avoidance. Formally $w^* \in [\frac{A}{(1-\delta)}, +\infty)$ and $\frac{\partial w^*}{\partial t} < 0$.

Having found the critical wage, we can identify the population share, x^*, that choose to pay full taxes, that is the share of the population with wages below the critical level w^*. This is given by

$$x^* = \Phi[w^*]. \tag{3}$$

Substituting w^* from (2) gives the solution to (3),

$$x^* = \Phi\left(\frac{A}{(1-\delta)t}\right) \tag{4}$$

which is the population share of full tax payers. Since $\Phi'(w) > 0$ there exists one unique population share x^* for each value of t. As can be seen in figure (1) x^* is a monotonically decreasing function of t implying that as taxes go up so does tax avoidance. In particular when $t = 0$, $x^* = 1$ since no one invests in tax avoidance at this point. On the other hand, when $t = 1$, $x = x_{\min}$ since every one with a wage higher than $\frac{A}{1-\delta}$ invests in tax avoidance. Formally the population share of full tax payers is a function $x^*(t) : [0,1] \to [0,1]$ with $x^*(0) = 1$, $x^*(1) = \Phi\left(\frac{A}{(1-\delta)}\right)$ and $\frac{dx^*}{dt} < 0 \; \forall t$.

2.2 Budget Balance Requirement

Taxes are collected to finance transfer payments. Given the results from the preceding section, the tax base can be divided into two parts. One part is made up of all individuals who pay full taxes given by

$$\Psi(w^*) = \int_0^{w^*} w\varphi(w)dw \tag{5}$$

and one part consisting of those who avoid tax given by

$$\Gamma(w^*) = \int_{w^*}^{\infty} w\varphi(w)dw. \tag{6}$$

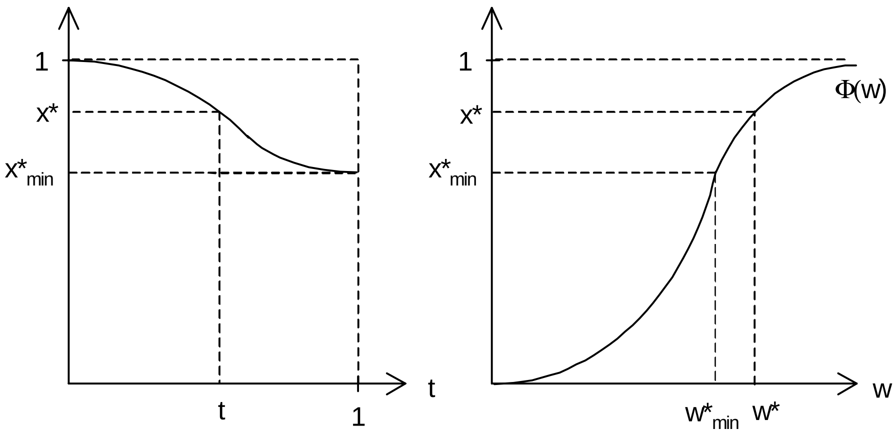

Figure 1: The relationships between the population share of full tax payers, x^*, and, in the left figure, the tax rate, t, and in the right figure, the cumulative probability distribution function, $\Phi(w)$.

$\Psi(w^*)$ is the wage sum for individuals with wages below w^*, who pay tw^i in taxes, and $\Gamma(w^*)$ is the wage sum for individuals with wages above w^*, who pay only δtw^i in tax. Both are normalized to per capita units.

Requiring the budget to be balanced gives the following expression for aggregate per capita expenditure on transfer payments:

$$r(t) = t\Psi(w^*) + \delta t\Gamma(w^*). \tag{7}$$

Let $\bar{\Psi}$denote the average wage,

$$\bar{\Psi} = \int_0^\infty w\varphi(w)dw, \tag{8}$$

then $\Gamma(w^*)$ can be written as

$$\Gamma(w^*) = \bar{\Psi} - \Psi(w^*)$$

and $r(t)$ can be rewritten as

$$r(t) = t[\delta\bar{\Psi} + (1-\delta)\Psi(w^*)]. \tag{9}$$

We see that the transfer function is a continuous function $r : [0,1] \to R_+$ with $r(0) = 0$ and $r(1) = \delta\bar{\Psi} + (1-\delta)\Psi(\frac{A}{1-\delta}) \leq \bar{\Psi}$. The interpretation of (9) is that everyone, including the tax avoiders, pay $t\delta w^i$, while those with income below w^* also pay an additional amount $t(1-\delta)w^i$. Thus, raising the tax has two effects on the size of the transfer. On the one hand there is a positive effect on $t\delta\Psi$, but on the other hand as t goes up w^*goes down, i.e. more people choose to avoid tax, and hence the share of individuals paying full taxes goes down. Formally, differentiating (9) with respect to t yields

$$r'(t) = \delta\bar{\Psi} + (1-\delta)\Psi(w^*) + t(1-\delta)w^*\varphi(w^*)\frac{dw^*}{dt}$$

which, using the fact that $w^* = \frac{A}{(1-\delta)t}$ and $\frac{dw^*}{dt} = -\frac{A}{(1-\delta)t^2}$, can be simplified to

$$r'(t) = \delta\bar{\Psi} + (1-\delta)\Psi(w^*) - \frac{A}{t}w^*\varphi(w^*). \tag{10}$$

>From (10) we see that the effect on the transfer function is composed of three parts. The first part, $\delta\bar{\Psi}$, is a positive constant, the second part, $(1-\delta)\Psi(w^*)$, is positive and strictly decreasing in t while the third, $-\frac{A}{t}w^*\varphi(w^*)$, is always negative but may increase or decrease over t depending on the density function $\varphi(w)$. In general $r(t)$ can hence be increasing or decreasing over t depending on the density function. If, however, the density function is decreasing in w this effect is monotonic. As t increases, w^* decreases, as can be seen from equation (4) and consequently the number of individuals affected on the margin increases. As long as the positive effect from increased taxes dominates the increase in tax avoidance, the slope of $r(t)$, that is (10), is positive but at some point an increase of the tax rate may cause enough tax avoidance for the avoidance effect to dominate and consequently $r'(t)$ would be negative. The transfer function would then be concave over t displaying a Laffer-effect caused by increasing tax avoidance.[15]

The second derivative is

$$r''(t) = \frac{A^2}{(1-\delta)t^3}(\varphi(w^*) + w^*\varphi'(w^*)), \tag{11}$$

and for $r(t)$ to be concave this expression must be negative and hence $\varphi(w^*) + w^*\varphi'(w^*) < 0$, which gives the condition that $r(t)$ is concave iff

$$[w^*\varphi(w^*)]' < 0$$

that is $w^*\varphi(w^*)$ must be strictly decreasing in w on the interval $[\frac{A}{1-\delta}, \infty)$.

2.3 Balanced States of the Economy

Combining the above results we can describe the state of the economy as being characterized by a triplet $s = (t, r, x^*)$. As is shown in section 2.1. there is

[15] Such effects are shown in the numerical example in section 4 where the $r(t)$ function is plotted for different parametrizations of the model.

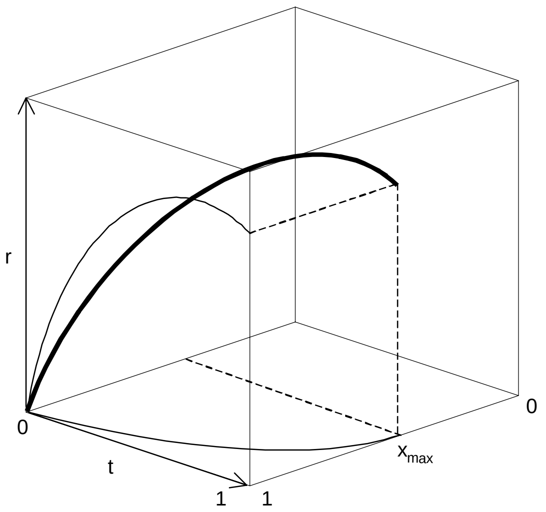

Figure 2: A set of balanced states of the economy with projections on the (r, t) and (x, t) planes.

a continuous function given by equation (4) which gives a fraction of full tax payers for every tax rate. As is shown in section 2.2 there also exists a continuous function given by equation (9) which gives a per capita transfer for every tax rate. Combining these functions we can define a balanced state of the economy as a function $s^* = (t, r, x^*)$ as one that simultaneously meets equations (4) and (9). As is shown in figure 2 s^* is a continuous function in $[0,1] \times [0,1] \times R_+$.[16]

2.4 Individual Optimization

The above specification creates a maximization problem for each individual. Since everyone will vote over the tax rate, implicitly choosing the size of the transfer, the problem is to choose a tax rate that solves

$$\max_t u(c^i) = \begin{cases} u(w^i - tw^i + r(t)) & if\ w^i < w^* \\ u(w^i - A - \delta t w^i + r(t)) & if\ w^i > w^* \end{cases} \tag{12}$$

where the transfer payment, r, is given by (9) and $t \in [0,1]$. This tax rate will also have an accompanying level of tax avoidance given by (4) and hence the choice of t implicitly chooses a point on the function $s^*(t, r, x^*)$.[17]

[16] This way of characterizing the economy is used in Lindbeck, Nyberg and Weibull (1999).

[17] It should be noted that the problem as it is posed in equation 12 is not fully specified since w^* is also a function of t. The problem will, however, be posed as a qustion of pair-wise comparison between tax rates, (a vote) in which the individual knows the compeating tax rates and their respective effect on the transfer and on the individual avoidance choice.

For an individual with income below the critical wage level w^* the first order condition for an interior solution is

$$\frac{du(c^i)}{dt} = u'(c^i)[-w^i + r'(t)] = 0$$

where $r'(t)$ is given by (10).[18] The optimal tax rate for individual i is then the tax that solves

$$w^i = r'(t). \tag{13}$$

Similarly, for an individual who has invested in tax avoidance the first order condition is

$$\frac{du(c^i)}{dt} = u'(c^i)[-\delta w^i + r'(t)] = 0$$

and the optimal tax rate solves

$$\delta w^i = r'(t). \tag{14}$$

The second order conditions are

$$\frac{d^2u(c^i)}{dt^2} = u'(c^i)r''(t) + u''(c^i)[-w^i + r'(t)]^2 < 0$$

and

$$\frac{d^2u(c^i)}{dt^2} = u'(c^i)r''(t) + u''(c^i)[-\delta w^i + r'(t)]^2 < 0$$

respectively. We see that the second order condition for an interior solution is satisfied if the transfer function is concave, that is if $r''(t) < 0$.

The intuition behind these expressions is straight forward. The most preferred tax rate for an individual is where the marginal gain from an increased transfer equals the marginal loss from the privately increased tax burden. A tax avoiding individual only pays tax on a fraction δw^i of his income and hence takes this into account when choosing the preferred tax rate.

These first order conditions are shown in figure 3. Given a fix distribution of incomes there would at each tax rate be a certain amount of tax avoidance, given by (4) above, and a corresponding per capita transfer given by (9). In the hypothetical case depicted in figure 4 the function $r(t)$ is such that the size of the transfer grows up to a point and then drops as the tax avoidance effect dominates the marginal increases in tax payments. For the individuals x and y, who never choose to invest in tax avoidance, the tax payments increase

[18] Corner solutions can easily be checked. In particular, if $r(t) < w^i\ \forall t$, then $t = \mathbf{0}$ and, if $r(t) > w^i\ \forall t$ and there is no interior solution, then $t = 1$.

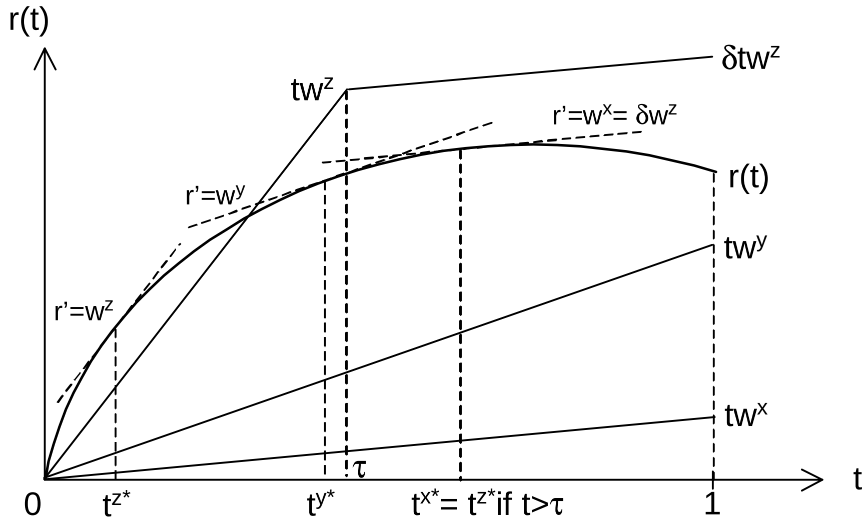

Figure 3: The first order conditions for individuals with different incomes.

linearly, with a steeper slope for y who has a higher wage than x. The preferred tax rate is the point where the marginal gain from an increased transfer equals the marginal loss from an increased private tax burden. Here individual y, not surprisingly, prefers a lower tax rate than individual x since y has the higher wage. Individual z, who has a higher income than x and y, will invest in tax avoidance at tax rate τ. At tax rates above this point he only pays δw^z and hence prefers a different tax rate which here happens to be equal to that of individual x.

3 Political Equilibrium

An analysis of a voting situation requires comparing preference orderings across individuals. To facilitate the analysis of the political equilibria we begin by establishing some properties of these preference orderings. Making two realistic assumptions simplifies the presentation and avoids some less interesting cases.

Assumption A1: The median income individual is never a tax avoider, that is $w^m < w^* \ \forall t$.

Assumption A2: The median income is smaller than the mean income, that is $w^m < \Psi$.

The above analysis of individual optimization showed that the preferences over tax rates depend on whether an individual has invested in tax avoidance or not. Treating the groups separately the preference ordering is easily established as determined by the wage within each group respectively. This can be shown

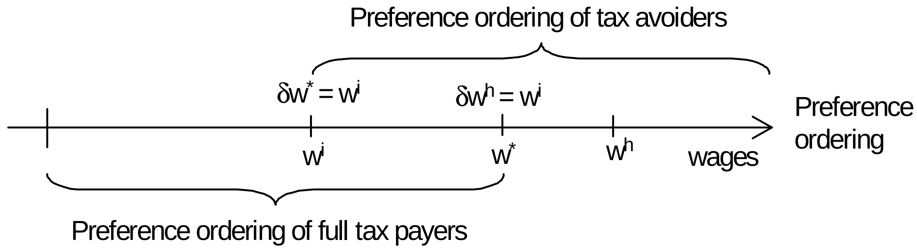

Figure 4: The overlapping preference ordering of tax avoiders and full tax payers.

using the Spence-Mirrlees condition, that is through showing that the marginal rate of substitution between t and r is increasing in w.[19] Here it becomes particularly simple since, for full tax payers (TP),

$$MRS_{TP} = -\frac{\frac{\partial u}{\partial t}}{\frac{\partial u}{\partial r}} = -\frac{u'(c)(-w^i + r'(t))}{u'(c)} = w^i - r'(t) \tag{15}$$

which is clearly increasing in w for all t. The condition for tax avoiders (TA) is analogous, giving

$$MRS_{TA} = \delta w^i - r'(t) \tag{16}$$

which is again increasing in the wage, w.[20] To get the preference ordering for the whole population we note that these marginal rates of substitution overlap in a particular way. More precisely, all individuals with wage $w \in (0, w^*)$ can be ordered according to (15) to form a continuum on $(0, w^*)$, and similarly everyone with wage $w \in [w^*, \infty)$ can be ordered on the same line over $(\delta w^*, \infty)$ according to (16) where $\delta w^j = w^i, w^j > w^i$. Furthermore every tax avoider with wage $w \in (w^*, w^h)$, where $t\delta w^h = w^*$ has the same marginal rate of substitution as a non tax avoider with lower wage. These overlapping preferences are shown in figure 4. In the particular case where $\delta = 0$ every tax avoider prefers the same tax rate as a non tax avoider with zero income.

Given a population that is fixed in tax avoiders and full tax payers these preference orderings are invariant for all tax schedules, and hence there exists a unique decisive voter.[21] It should be noted that in the case where the population

[19] Satisfying the Spence-Mirrlees condition is equivalent to satisfying the single crossing condition as is shown in Milgrom (1994) and in Gans and Smart (1996).

[20] Since $r'(t)$ is present in both equations we can ignore it and simply rank the preferences according to the individual tax bases, which means the whole wage for full tax payers and a fraction of it for tax avoiders.

[21] A preference ordering that is invariant over all different tax schedules is equivalent with the Hierarchical Adherence condition in Roberts (1977). The connection to the Spence-Mirrlees condition is due to Milgrom (1994) and to Gans and Smart (1996) who also note that the only condition on the aggregate response function $r(t)$ is that it be a function. The result was first shown in Milgrom and Shannon (1994).

is fixed into tax avoiders and full tax payers w^* is not, by definition, a function of the tax rate but rather the lowest wage among the tax avoiders.

The decisive voter can be of three types; either it is the median income earner (w^m), or a pair of a tax avoider with income w^j and a full tax payer with income $w^i < w^m$ such that $\delta w^j = w^i$, or, in the case that $\delta = 0$, it is an individual with income $w^i < w^m$. The first is the case if the tax avoidance technology is so inefficient that $\delta w^* > w^m$, then the median income earner remains the median person in terms of preferences too. Relative to the median income earners preferred tax rate everyone to the left want higher taxes while everyone to the right want lower taxes. The second case is realized if $\delta w^* < w^m$. Then some of the tax avoiders form a coalition with individuals with wages below that of the median income earner and hence the decisive voter becomes a pair of a tax avoider and a non-tax avoider with income $w^i < w^m$. In the case that a tax avoider pays no tax at all, i.e. $\delta = 0$, they all have the same preference as an individual with zero wage and hence, given that the tax avoiding population is not more than half the population which follows from assumption 1, the decisive voter is one with an income $w^i < w^m$. In sum we have established that;

Proposition 1 *If the preference ordering is invariant of the tax rate there exists a majority voting equilibrium. The decisive voter is the median income earner* w^m *only if* $\delta w^* > w^m$*. If* $\delta w^* < w^m$ *the decisive voter is a coalition of an individual with lower wage than the median,* $w^i < w^m$*, and one with a higher wage than the median,* $w^i < w^m$*, and in the case that* $\delta = 0$ *the decisive voter is one with lower wage than the median,* $w^i < w^m$*.*

If, however, the population is not fixed into two groups but rather, as has been discussed in section 2 above, tax avoidance is a function of the tax rate the preference ordering will not be invariant of the tax rate. Now w^* is a function of the tax rate as is described above in section 2.1, equation (2) and individual preferences jump as an individual goes from paying full taxes to choosing tax avoidance. An individual may at one point, when he pays full taxes, prefer a lower tax rate to a higher one, while in a comparison between this and an even higher tax rate he may prefer the latter since he in that situation has invested in tax avoidance and pays a lower marginal tax. In such a situation a majority voting equilibria need not exist since preferences are neither single-peaked nor single-crossing and hence none of the median voter theorems applies. We can, however, specify when a majority voting equilibrium exists and in cases when it may exist give some characteristics of the outcome and of the decisive voter. This is done in the two following propositions;

Proposition 2 *If tax avoidance is a function of the tax rate the preference ordering is not invariant over tax schedules. A majority voting equilibrium still exists if* $\delta w^* > w^m \ \forall t$*. In this situation the median income earner is the decisive voter.*

Proof. Compare a tax rate, t, to another tax rate, t', and let t be the preferred tax rate of the median income earner. Then if $t' < t$, t is also preferred by everyone with wage $w^i < w^m$ by equation (15). If $t' > t$ everyone with wage $w^j > w^m$ prefers t since they either pay taxes and then, by equation (15), prefer t, or they avoid taxes, but not enough for them to ever prefer $t' > t$, since if $\delta w^* > w^m$ then by equation (16) the MRS_{TA} is always larger than that of the median income earner. Hence if the median prefers t over $t' > t$ so does anyone with income higher than the median, regardless of whether this individual avoids taxes or not. This means that the preferred alternative of the median income earner, t, beats any other tax rate, t', in a pair-wise comparison and hence the median income earner is decisive.□

Proposition 3 *If tax avoidance is a function of the tax rate and the preference ordering changes over tax schedules and $\delta w^* < w^m$ then, if a majority voting equilibrium exists, the median income earner is not the decisive voter.*

Sketch of *Proof.* If $\delta w^* < w^m$ then there is always a majority, by the same logic as above, that prefers a tax rate which is higher than the median income earners preferred tax rate t. This majority consists of everyone with wages below the median and the tax avoiders with wages such that $\delta w^j < w^m, w^j > w^*$.□

Corollary 4 *If $\delta w^* < w^m$, and a majority voting equilibrium exists, then the equilibrium tax rate will be higher than that preferred by the median income earner.*

We can also note that if the transfer function only has one maximum for the decisive voter(s) this equilibrium is the unique majority voting equilibrium.

Having established the variety of preference orderings we can now move on to studying the political equilibria in the model. Individuals vote over taxes and the decision will be taken by majority rule. A political equilibrium can then be defined as a tax rate, t^*, with a corresponding population share $x^*$of full tax payers and a balanced budget, such that no other tax rate is preferred by a majority of the population. That is a point on $s^* = (t, r, x^*)$ such that no other point is preferred by a majority of the population.

As will be shown the political equilibria will depend on the timing of the tax avoidance decisions. First we look at the case when investments in tax avoidance are made before the election, then at the case when tax avoidance decisions can be taken after the election.

3.1 Investments in Tax Avoidance Before the Election

If the decision to invest in tax avoidance must be taken before the election, a time inconsistency problem emerges. The situation is similar to that of the so called "capital levy problem" in the capital taxation literature, and is due to the fact that the situation *ex ante* is different from that *ex post.*[22] The individual maximization problem is given by equation (12) above and the transfer function

[22] See e.g. Persson and Tabellini (1990) and (1994) for a discussion of the capital levy problem.

is given by equation (9). However, in a situation where investments in tax avoidance have been made and can not be changed, the *ex post* elasticity of the tax base is zero. When differentiating (9) we get

$$r'(t) = \delta\Psi + (1-\delta)\Psi(w^*) + t(1-\delta)w^*\varphi(w^*)\frac{dw^*}{dt}$$

where now $\frac{dw^*}{dt} = 0$, so $r'(t)$ is *ex post*

$$r'(t) = \delta\Psi + (1-\delta)\Psi(w^*)$$

with a fixed w^*. The expression $r(t)$ is hence a constant and the transfer function is consequently, *ex post,* a line. Since every individuals' tax payment is also given by a line the only possible equilibria are the corner solutions, $t = 0$ and $t = 1$. It is easy to see that $t = 0$ never is an equilibrium since by assumption A2 the median income earner, who would be decisive if $t = 0$, has a lower than mean income and hence gains from redistribution at $t = 1$. So the only possible equilibrium candidate is $t = 1$. This is indeed an equilibrium if the tax payment of the decisive voter (tw^i and possibly δtw^j) is smaller than $r(t)$, for $t = 1$.

Since this outcome is anticipated by those who can contemplate tax avoidance, everyone with wage $w \geq \frac{A}{(1-\delta)}$ choose to invest in avoidance. As we can see in figure 5 this leads to a problem for the decisive voter who would in fact prefer a lower tax rate. If there is no way of committing to the interior tax rate, however, the outcome leads to more tax avoidance than what would be optimal from the point of view of the decisive voter.

This leads to the following proposition:

Proposition 5 *If decisions about tax avoidance must be made before the election, and can not be changed afterwards, the only possible political equilibrium is the balanced state* $s^* = (1, r(1), x_{\min})$.

The possible political coalitions follow from Proposition 1 and can, depending on δ, consist of richer individuals, who avoid tax, in coalition with the poorest part of the population, as well as of a more "traditional" coalition of the richer half of the population being politically opposed to the poorer half.[23] In terms of disposable income the result is that after tax income is completely equalized for the full tax payers while those who avoid tax have more.

[23]Theoretically there is a possibility that no political equilibrium exists. If $r(t)$ when $t = 1$ is smaller than the tax payment of the decisive voter when $t = 1$, then there is no equilibrium. The decisive voter would then implement $t = 0$. One should note that this does not contradict Proposition 1 since a majority voting equilibrium exists in this situation ($t = 0$). This is not a political equilibrium, however, since the amount of tax avoidance is higher than what it should be due to the fact that $t = 0$ is not credible *ex ante*.

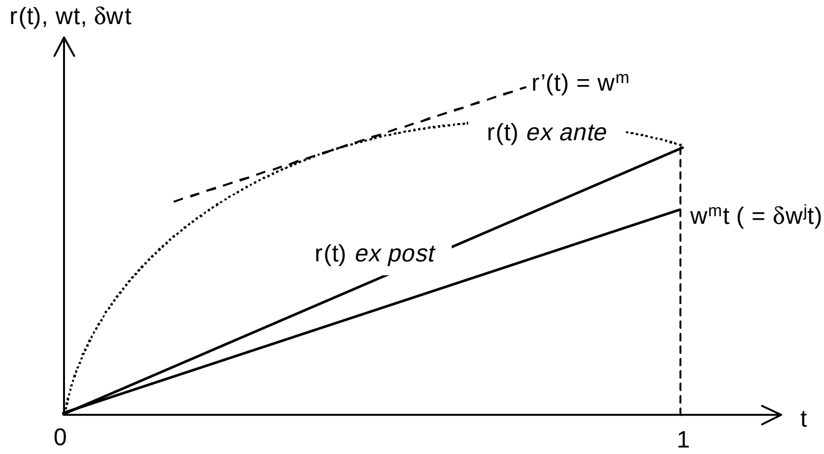

Figure 5: The ex ante transfer function and the only equilibrium ex post transfer function.

3.2 Tax Avoidance After the Election

In the more realistic case that individuals can invest in tax avoidance after the election, the tax base is no longer inelastic *ex post.* At the time of election everyone knows that every tax rate leads to a corresponding amount of tax avoidance which affects the size of the transfer. Individuals solve the maximization problem given in section 2.4. above, and, depending on how efficient tax avoidance is, we can distinguish two cases with different equilibrium outcomes which will be studied separately.

3.2.1 Traditional Conflict; the Rich vs. the Poor

In a case where the tax avoidance technology is sufficiently inefficient, individuals who invest in tax avoidance still have a larger tax base than the median income earner, and consequently pay more in taxes, a majority voting equilibrium exists by Proposition 2. The decisive voter is the median income earner who solves the maximization problem given in section 2.4. above.[24] The equilibrium tax rate is now any tax rate that solves the optimization problem for the median income earner. The implementation of this tax rate will give a certain, calculated, amount of tax avoidance and a per capita transfer, that is a point on the s-function, $s = (t, r, x^*)$. One should note that there is no reason for the optimal tax to be one even though everyone above the median always has a larger tax base than him. The tax base that maximizes the decisive voter's disposable income is the optimal trade-off between tax the rich more and caus-

[24]By assumption A1 we have that the median income earner is not a tax avoider so the problem is that of a non tax avoider.

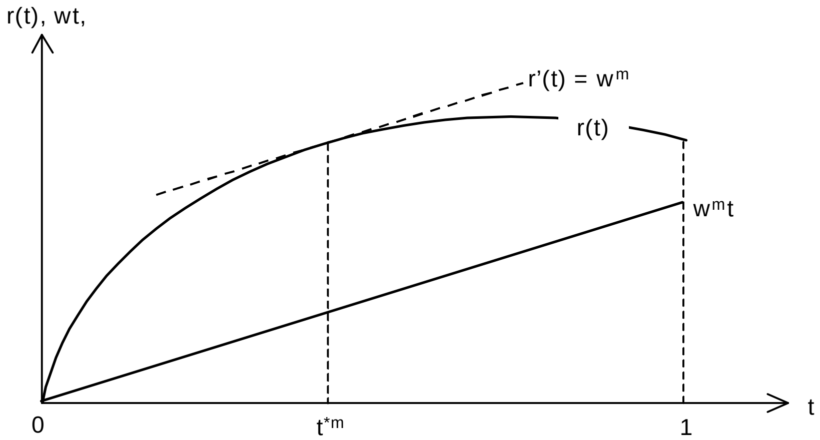

Figure 6: The majority voting equilibrium tax rate when the median income earner is decisive.

ing more avoidance. The solution to the optimization problem is illustrated in figure 6.

We can make the following proposition:

Proposition 6 *If the tax avoidance technology is such that* $\delta w^* > w^m \ \forall t$, *a majority voting equilibrium exists and the median income earner is the decisive voter. The political equilibrium is the balanced state* $s^* = (t^{m^*}, r(t^{m^*}), x^*(t^{m^*}))$.

Proof: This follows straight from Proposition 2.□

In this situation everyone with higher income than the median would prefer a lower tax rate while everyone with a lower income prefers a higher tax rate. In terms of political coalitions this situation can therefore be characterized as one where all "the rich" would prefer lower taxes and less redistribution, while all "the poor" would prefer higher taxes and more redistribution.

3.2.2 Coalitions Between the Rich and the Poor

In the case that the tax avoidance technology is sufficiently effective (low enough δ) an individual who invests in tax avoidance may get a tax base which is lower than that of the median income earner. In such a case the median income earner's preferences will no longer determine the tax rate. Instead this is determined by a "pivotal pair" of one individual with lower income than the median and one tax avoider with higher income, or, in the case when tax avoidance is complete ($\delta = 0$), an individual with lower than median income. A majority voting equilibrium may also fail to exist. If it exist, however, it will be one with a higher tax rate, more redistribution and more tax avoidance than if the

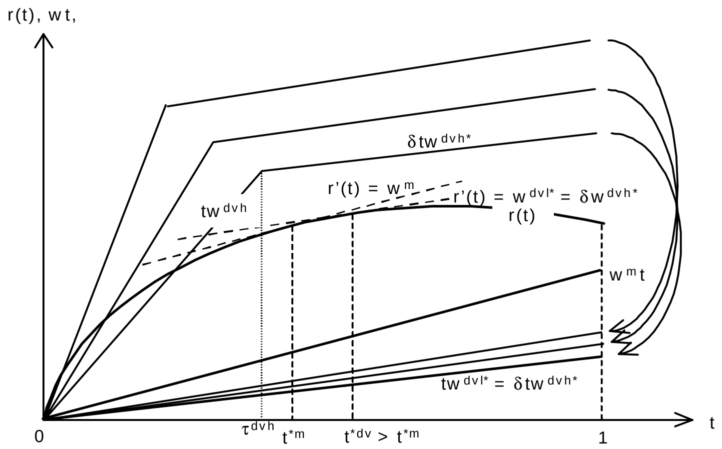

Figure 7: Preferences jump to to being in favour of a higher tax than that prefered by the median income earner.

median voter's preferences would prevail.[25]

Proposition 7 *If the tax avoidance technology is such that* $\delta w^* < w^m$ *the median income earner is not the decisive voter. If a political equilibrium exists it is a point* $s^* = (t', r', x^{*\prime})$ *where* $t' > t^{m^*}$, $r' > r(t^{m^*})$ *and* $x^{*\prime} < x^*(t^{m^*})$.

Proof: The first part follows from Proposition 3, and the second part from Corollary 4 and the fact that x^* is strictly decreasing in the tax rate.□

Looking at figure 7 we can see the differences to the median income earner's preferred tax rate. Realizing that half the population favors a tax higher than, or equal to, that favored by the median income earner a number of individuals, with high incomes, realize that they will choose to invest in tax avoidance. Given that, their preferences shift to being in favor of a tax rate higher than the median income earner's preferred tax rate. Now a majority of the population favors a tax rate higher than t^{m^*}. An equilibrium, if it exists, is therefore a tax rate $t' > t^{m^*}$, preferred by a decisive-voter-coalition consisting of one individual with lower income than the median (dvl) and one with higher (dvh).

4 Numerical example

In the following the theoretical arguments from the previous sections are illustrated using a numerical example. A population of individuals $i \in \{0, 1, 2, ..., 100\}$ are assumed to have exogenously given wages in the interval $[0, 1000]$.[26] The median income is 155 which is lower than the mean income, 198. Even though the

[25] These results are similar to those in Epple and Romano (1996a) and (1996b).

[26] In this example the distributions are discrete for computational convenience.

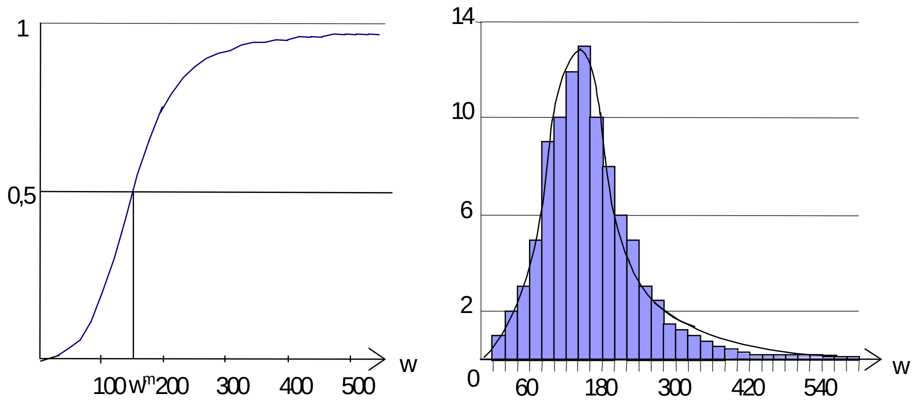

Figure 8: The c.d.f. and p.d.f of the numerical example.

example is hypothetical the distributions have been chosen so as to approximate an actual wage distribution. The cumulative probability distribution function and the corresponding density function are shown in figure 8.

The tax avoidance technology is, as presented in section 2.1, governed by two parameters, the cost, A, and the efficiency, δ. Changing these parameters affects the population share of full tax payers, x^*, as is shown in figure 9, in similar ways. In the left graph the avoidance cost is fixed to $A = 160$. The fraction of taxes paid if one invests in tax avoidance is then varied. The effect is, not surprisingly, that the share of full tax payers, decreases faster the more effective the avoidance technology is. In the graph to the right the efficiency has been fixed to $\delta = 0.5$ with a similar effect on avoidance. As the cost decreases so does the share of full tax payers. From a redistributive point of view, however, the two parameters have different characteristics. A very efficient but expensive technology, (low δ and high A), would benefit the very richest part of the population, while a technology that is not too expensive, but on the other hand does not lower the tax very much, would not create as large an advantage for the most affluent. They would, even after investing in tax avoidance, remain large contributors to the redistributive system.

The changes in the population share of full tax payers, x^*, and the effectiveness of the tax avoidance technology also effects the per capita transfer function

$$r(t) = t[\delta\Psi + (1 - \delta)\Psi(w^*)].$$

As was discussed in section 2.3 the effect from a tax increase is, on the one hand, that raising t has an obvious positive effect on $r(t)$ but on the other hand the composition of the tax base shifts to containing more tax avoiders. This avoidance effect may well dominate the positive effect, making $r'(t)$ negative. In figure 10 the transfer function has been plotted for different avoidance efficiencies

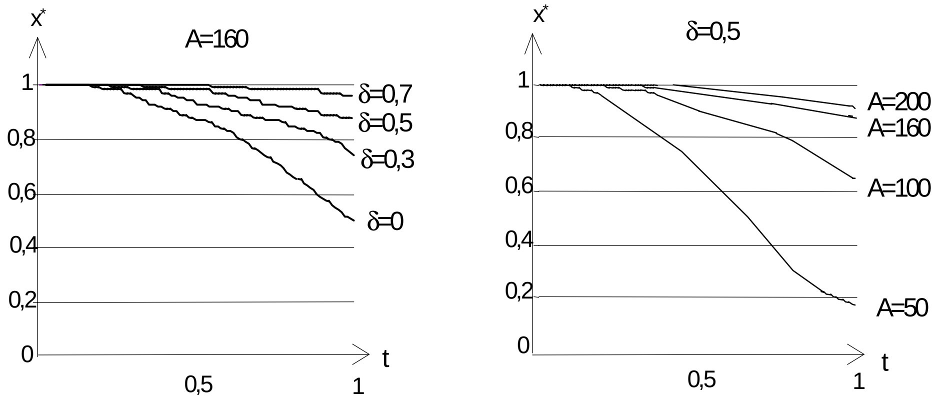

Figure 9: The effect on x^* from changing the efficiency of tax avoidance, keeping the cost fixed (left), and from changing the cost, keeping efficiency fixed (right).

holding the cost constant, $(A = 160)$. The graph also shows that the transfer function is likely to be concave for the kind of wage distribution that has been used here.

4.1 Political Equilibria

Following the structure of section 3 we look at three different cases. First the situation where the avoidance decision has to be made before the election and can not be changed afterwards and then two different situations when tax avoidance is determined after the election. One where the median income earner is the decisive voter and one where a coalition of rich and poor voters form. Lastly a comparison of these three cases will be made looking at the tax levels and the redistributive consequences.

4.1.1 Tax Avoidance Before the Election

In this situation the credibility problem discussed in section 3.1 emerges. The decisive voter has a lower wage than the average and will hence, *ex post,* choose to set the tax to one given that the tax base is totally inelastic. Anticipating this everyone who can would invest in tax avoidance. Assuming that the avoidance cost is $A = 160$ and that the efficiency is $\delta = 0.5$, then at the only credible tax rate, $t = 1$, the critical wage, by equation (2), is $w^* = 320$. In this situation, as can be seen in figure , the after tax and transfer income would be completely equalized for everyone who does not avoid tax, while the tax avoiders are not fully effected.

To show the redistributive effect of a tax avoidance technology which is more expensive but also more effective we also consider the case where $A = 320$ and

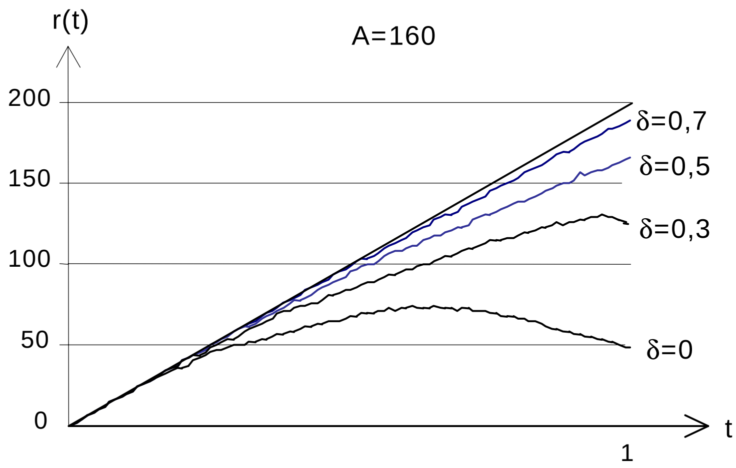

Figure 10: The transfer function for different values of δ.

$\delta = 0$, that is tax avoidance is complete. The critical wage remains $w^* = 320$ but those who have made the investment now pay nothing in tax only the avoidance cost 320. As is shown in figure , the disposable income is again equalized for the non-tax avoiders but now at a lower level since the tax avoiders no longer contribute at all to the transfer system. Those who have invested in tax avoidance have more left than in the previous case.

4.2 Tax Avoidance After the Election

When investments in tax avoidance can be made after the tax rate has been determined the tax base is no longer, *ex post,* inelastic and as a consequence the decisive voter now has to balance the positive transfer effects of higher taxes with the increase in his private tax burden and the increase in tax avoidance that follows from it. As was discussed in section 3.2 a distinction can be made between situations when the median income earner is the decisive voter and situations when a coalition will form between avoiders and those with lower income than the median. In the following these two possibilities will be exemplified.

Consider first a case when $\delta = 0.5$ and the avoidance cost is $A = 160$, which is the same parametrization that was used in the first case above when avoidance decisions had to be made before the election. It follows from proposition 6 that, since $\delta w^* > w^m$ (here $0.5 * 320 > 155$), a majority voting equilibrium exists and the median income earner is the decisive voter. It turns out that the median income earner in this case maximizes his income when the tax rate is 53% and hence this tax rate would be implemented under majority rule. The first order condition is shown in figure 12. Everyone with lower income would prefer a higher tax rate while those with higher income would prefer a lower tax rate,

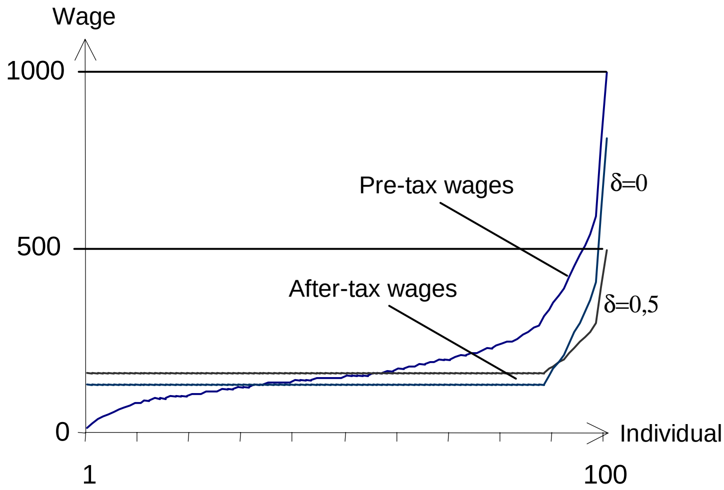

Figure 11: The redistributive outcome for different avoidance technologies when the tax avoidance investment has to be made before the election.

and in that sense the political conflict can be characterized as one where the rich oppose the poor.

Now instead assume that the tax avoidance technology is such that the investment $A = 160$ leads to complete tax avoidance, i.e. $\delta = 0$. By proposition 7 the median income earner is no longer decisive. Instead the decisive voter, if a majority voting equilibrium exists, will be an individual with lower income than the median. Those who have invested in tax avoidance no longer pays any tax and hence their objective becomes to maximize the transfer payment. Their political preference now becomes aligned with an individual who has a zero income and for this reason pays no tax. A numerical solution can be found through iteration and in this case it turns out that the decisive voter will be the individual with income $w = 152 < w^m = 155$ who, with the support of the richest individuals, finds a majority for his preferred tax rate 29 %. This is higher than the median voter's preferred tax, 26%. Politically a coalition now has been formed between the very richest and the poorer part of the population. Figure 13 shows the first order conditions in this case.

The redistributive consequences are quite different in these cases compared with the situation when the avoidance decision had to be irreversibly taken before the election. Taking the avoidance effect into account the decisive voter now chooses an interior tax rate such that an optimal balance is struck between increased payments from those who do not avoid tax and the increased tax avoidance. In such an extreme case as that when the tax base is completely lost in case of avoidance this tax rate can be relatively low, as in the latter example. One redistributive aspect which is present, but not as pronounced, in these cases

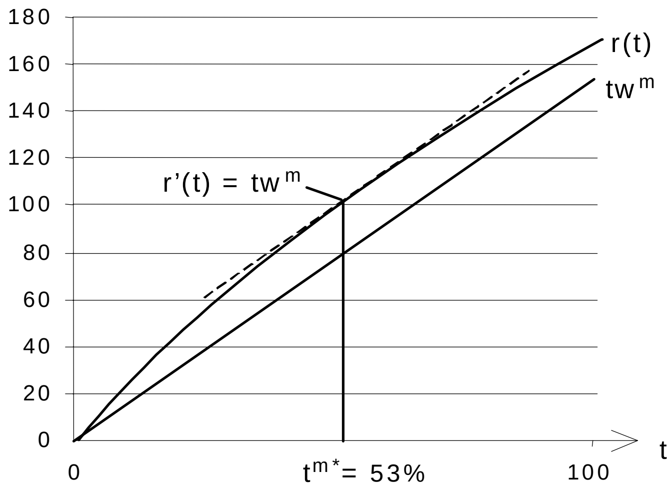

Figure 12: The decisive voter's first order condition giving the equilibrium tax rate, in the case when $\delta w^* > w^m$. Here $A = 160$ and $\delta = 0,5$.

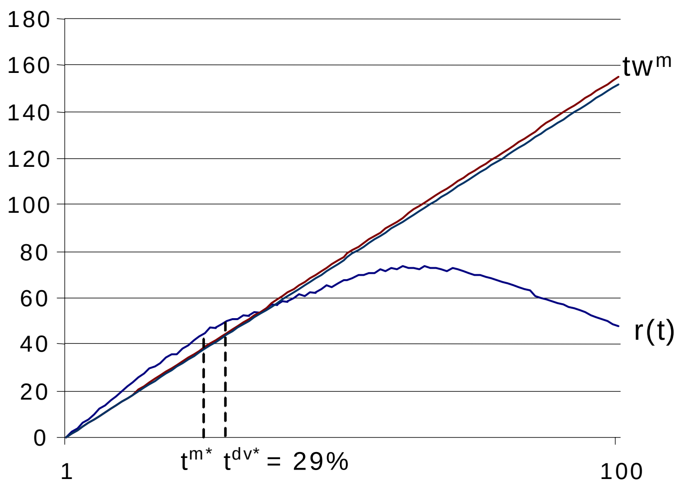

Figure 13: The decisive voter's first order condition giving the equilibrium tax rate, in the case when $\delta w^* < w^m$. Here $A = 160$ and $\delta = 0$.

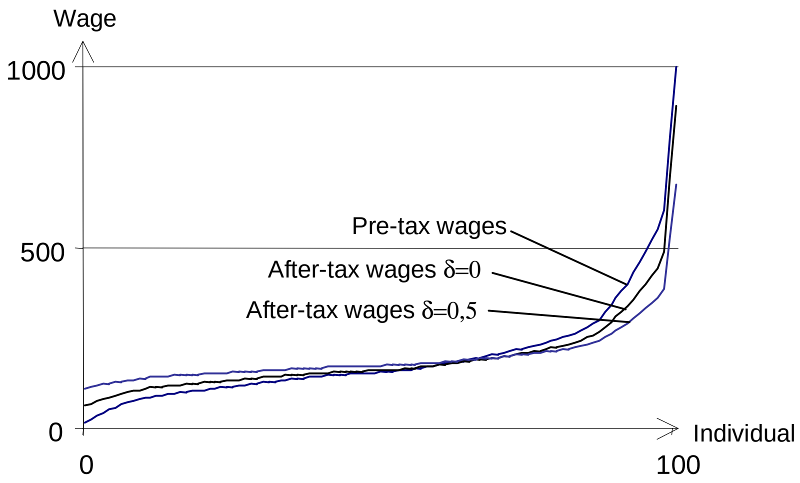

Figure 14: The redistributive outcome for different avoidance technologies when the tax avoidance investment is made after the election.

as in those with avoidance decisions before the election is that the richest part of the population pay a decreasing fraction of their wage in tax. Figure 14 depicts the after-tax-and-transfer incomes in the same way as is shown in figure 11.

Since the equilibrium tax rate is interior in these cases, there is not complete equalization of wages. There is redistribution though, but again with the feature that the very richest part again manage to pay less in "actual taxes" than the official tax rate, through their investments in tax avoidance.

5 Concluding Remarks

Taking a step back from the details of the model some results stand out as being particularly interesting. These results also point out areas of interest for future studies.

First, in terms of redistributive outcome, tax avoidance has been shown to be qualitatively different with respect to the most affluent. In all situations studied above, the richest part of the population manage to lower their actual tax burden through investing in tax avoidance. Even though the official tax is the same proportional rate, everyone with wages above the critical level will pay proportionally less. The same would of course be true if taxes were progressive. As such, this kind of model can create the *appearance* of redistribution going from the rich to the poor. An illusion with great political importance, noted early on by F.A Hayek.[27] This could also "be viewed as an ingenious way of

[27] Hayek's insight is quoted in Slemrod (1998) and appeared first in Hayek (1960).

reconciling incompatible political ambitions".[28] On the one hand the official policy is to redistribute income, but at the same time the tax avoidance possibilities prevents the tax system from destroying the incentives of the rich. This in turn would be potentially important for the effect of taxes on growth. Furthermore, this aspect of the model could help explaining the apparent paradox of wealth distribution in a country like Sweden where the distribution of wealth is as skewed as in the US, despite the fact that for a long time the official tax scheme has aimed at equalizing the disposable income.[29] Studying the political side of models that combine labor supply decisions and tax avoidance also seems like an important topic for future research.[30]

Another important point is that in a situation where tax avoidance is possible, the rich may even favor more redistribution and higher taxes, due to the retrospectively obvious fact that they do not pay them (at least not in full). This in turn creates the possibility of political coalitions between the rich and the poor raising taxes at the expense of the middle income earners, in particular those who are "just to poor to be rich". This certainly puts the old truth about politics favoring the median (income earner) in a different light. Furthermore, concerning the extension of franchise, Toqueville's claim that "universal suffrage really does hand the government of society over to the poor", needs to be modified to government being controlled by "the poor and the very rich".

[28] Agell and Persson (1999), p. 29.
[29] Domeij and Klein (1998).
[30] Examples of such models are Agell and Persson (1998) and Slemrod (1998).

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